

Written Testimony

Statement of
Daniel S. Goldin
Administrator
National Aeronautics and Space Administration

before the
Committee on Science
United States House of Representatives

February 12, 1997

I am pleased to appear before the committee to discuss the status of the International Space Station, particularly, as you requested, our cooperative activities with Russia.

I want to start with a little context. I think it's important to see where we are today in terms of where we've been.

By 1993, we had spent over 10 years in the design and development of a space station, having spent over \$10.2 billion without producing a single piece of flight hardware. We faced other problems, such as cost growth and inefficiencies driven by a layered and fragmented management approach and multiple contractors with no prime contractor. Space Station had become associated with continuous redesigns and capability reductions, which were driven by fiscal constraints. However, these problems are by no means a negative reflection of the people working on the program today, or yesterday. The quality and commitment of the people supporting this program have been and continue to be outstanding.

In 1993, under President Clinton's leadership, we were asked to redesign the Space Station one last time and to consider bringing in the Russians as partners. Our evaluation showed that it made sense then, and it makes sense now. The distinguished Charles Vest panel reconfirmed that an international partnership including the Russians was the right decision. We would gain enormously from the Russians' expertise, and it would give us critical redundancy in the functions of life support, attitude control, extravehicular activity and launch support. At the time, the only launch vehicle planned to service the Station was the Space Shuttle. Now, we have two operational launch systems with access to multiple launch vehicles. Other benefits of adding the Russians included: a significant increase in power and pressurized volume and early human habitation. It is also giving America the opportunity to learn about assembling a large, highly technical project in space and to learn from the only country in the world that has spent 10 continuous years in space on Mir.

When the Russian's joined the partnership, estimates were that \$2 billion dollars and approximately 18 months of schedule would be saved. We committed to building the Station within a level annual funding cap of \$2.1 billion and to complete International Space Station assembly for \$17.4 billion. So far, we have met these commitments and intend to continue to perform to them in the future.

That's where we were in 1993, and those were some of the benefits that were considered when the Russians were invited to join the program.

Before the Russians joined the ISS program, its biggest weakness was this: Apollo had Mercury and Gemini, where invaluable experience could be gained in areas including logistics, EVA and assembly. Space Station had no such precursor programs before we added the Shuttle-Mir flights. Without the Shuttle-Mir flights, building the Station would have been at significantly increased risk. In fact, the current Hubble mission will use techniques we learned from the Shuttle-Mir missions.

The joint Shuttle-Mir missions, are symbols of the benefits of U.S.-Russian cooperation, have provided tremendous concrete scientific and technical results. One of the key observations we have found in working with the Russians is that Shuttle science is task-oriented. We conduct science for two weeks at a time in space, and spend an enormous time in preparation. Hence, we have procedures developed to address specific task scheduled to be performed on a mission or which might occur in-flight. The Russians cosmonauts train to be skill-oriented. The Russians have used their advantage in long-duration missions to learn effectively how to live and work in space. We are bringing the best aspects of both programs into the utilization and operations planned for the International Space Station.

Through our work with the Russians, the U.S. has gained significant knowledge in a number areas: We had never docked the quarter-million-pound Shuttle with another large spacecraft at 17,000 m.p.h. and within a 600-pound docking force constraint. We have successfully demonstrated that the five-minute launch window will not impact our assembly schedule; the number of protein crystals which can be grown through conventional techniques has been expanded by 30 times; and we have demonstrated joint ground and mission control operations can work effectively and collaboratively.

We started out in October, 1993, with a clean slate with a brand new partner. It's unbelievable that we have had five successful docking missions, one rendezvous mission, and learned all that we have. We never said this complex, precedent-setting project would be easy.

We have also made significant progress in the development of International Space Station hardware and software. Since 1993, we've completed over 56% of the planned program, which has yielded over 162,000 pounds of U.S. flight hardware. The program has been, and is, set on a steady course. As we enter our fourth year since the redesign, the program continues to perform within the annual funding cap of \$2.1 billion and the \$17.4 billion completion estimate. We have accommodated the needs of our international partners, while maintaining our own U.S. objectives, commitments and major milestones.

Early assembly flights are moving from qualification to integration activities. In a few short months we will be shipping flight hardware to the Kennedy Space Center where it will be readied for integration with the Shuttle. Likewise, the first element to be launched, the Functional Cargo Block (FCB), is on schedule to be shipped to the Baikonur cosmodrome in May in preparation for its launch. Given the

breadth and complexity of this program, and experience seen in other major government development programs, we have demonstrated strong performance. We are literally less than a year from the start of on-orbit assembly of an unprecedented orbital research facility. I am very proud of the NASA/Industry team. They have worked long hours and demonstrated a true commitment to the American people in delivering the International Space Station.

We've also added capabilities. The ISS redesign in 1993 fixed a set of capabilities to a cost and schedule. Since that time, we have enhanced several of the capabilities within our existing program budget. While the science focus of the redesign was on life and microgravity sciences, we have continued to enhance the station capabilities. The attached payload capability allows observing payloads the capability to view down at earth and up into deep space. One of the early attached payloads will be the Alpha Magnetic Spectrometer (AMS), proposed by Dr. Sam Ting, a Nobel laureate. The intent of the AMS experiment is to investigate dark matter and antimatter, in addition to making other astronomical measurements. The addition of an optical quality window to the US Lab also enhances the resources for observing experiments. In addition, the Centrifuge and its new dedicated module significantly increase the useful volume for research. This may also be further improved with the potential provision of an additional node by the Europeans. This new node will have room for four more research racks. We are also studying ways to dramatically improve the communications for the ISS to provide better access to and data from experiments.

As we continue to develop the ISS, the research community continues to look at the ISS as a potential testbed for many systems and sensors, including free flying platforms. Although these capabilities were not specifically envisioned in 1993 we continue to enhance the potential of this research laboratory.

The Russians are going through dramatic changes, unlike anything we have ever experienced. They went from totalitarianism to democracy overnight. From a controlled economy to an open one. They have been presented with serious challenges. They are struggling to meet their commitments under harrowing circumstances. Still, the Russian produced FGB is the most mature piece of hardware we have. And it's on time and on budget. Russian industry has demonstrated that they can deliver when adequate funding is provided.

The funding difficulties experienced by our Russian partners have delayed production of the Service Module from April to December of 1998. This has caused us to initiate contingency plans to ensure that we can continue the assembly process despite the delay of this key element. This plan includes an alternative to the Service Module should it fail to be delivered and we are examining ways to provide an interim solution that adds important redundancy and robustness to the Space Station before the Service Module arrives. This would provide assembly stability should the Service Module be delayed beyond its current assessed launch date of December 1998.

NASA and Russian teams worked very hard throughout December and January to develop options for minimizing the impact of the SM

delay and to protect the overall assembly schedule from any additional delays. This effort concluded that an Interim Control Module (ICM) would be required to provide redundancies to ISS capabilities for reboosting and attitude control, should the Russians have further delays in providing their contributions.

We are presently considering two options for the ICM. The first makes use of U.S. hardware developed by the Naval Research Laboratory. The second uses the Russian module being developed independently by Khrunichev as a backup to the FGB module, called FGB 2. We are working vigorously on both options because we want to have the best information available if the decision to pursue the ICM is necessary. Both options have advantages and disadvantages. NASA and Russian teams are now working technical details of the FGB 2's capability to meet NASA's requirements, and they will provide their recommendations to RSA General Director Koptev and me in late February. Given the recent information we have just received from the Russians during the Gore/Chernomyrdin Commission we will need time to validate and review these recommendations. This is not to say that the best path, given budgetary and schedule considerations, may be to adhere to the original schedule.

For the long term, NASA and the Russian teams are also looking at using Russian-provided fuel tanks carried by the Shuttle to provide a refueling capability for the ISS. This option will make the ISS a more robust Station by providing the means to refuel by both Russian and American vehicles.

To meet the late 1998 launch date for the SM, RSA needs to sign a number of subcontracts for critical long-lead items before it receives its first budget payment in late February. To cover this funding gap and to allow RSA to meet its schedule, NASA has negotiated a modification to the existing NASA/RSA contract to rephase milestones for the last long-duration Phase 2 missions to the Russian Mir space station. This will provide RSA a total of \$20 million early in 1997. RSA has already met its first rephased milestone and received the first payment of \$12 million on January 31. This is not new money, but is rephasing of committed funds from the existing NASA/RSA contracts. As agreed in the contract modification, RSA must still meet its original obligations for the Phase 1 missions. RSA also agreed to give NASA greater insight into SM development activities and to conduct a General Designer's Review for the SM in March, which NASA will attend.

Updates to the assembly sequence through flight 7A, or the end of Phase 2, have been developed based on the above options and are being validated against information just received from the Russians. This is not a redesign. These sequences maintain the final launch of Phase 2, the launch of the U.S. Airlock in May 1999, within a month of the original baseline schedule. The remainder of the ISS assembly schedule in Phase 3 is still being reviewed. Of course, any proposed changes to the assembly sequence will be discussed in consultations with all of our Space Station partners. Final decisions will be approved by the Space Station Control Board.

For the past 16 months, we have had questions regarding the Russian government's ability to provide steady and adequate funding for its

contribution to the ISS. Time and again, we were told that the problem would be resolved. Last summer, at the highest level, Russian government officials said the lack of funding would be resolved. It didn't happen. We communicated all this to appropriate Congressional committees and worked steadily to develop options to mitigate the effects of inadequate Russian funding. Since then, your frustration has grown; my frustration has grown; as it became clear that the first Russian element, the Service Module, would not make its scheduled delivery date. We asked that Vice President Gore help to resolve this issue at the February meeting of the Gore/Chernomyrdin Commission.

U.S.-Russian cooperation in space is a critical underpinning of the success of the U.S.-Russian Joint Commission On Economic and Technological Cooperation. At last week's Gore/Chernomyrdin Commission, Prime Minister Chernomyrdin talked to the Vice President about the tremendous benefit of the Shuttle-Mir program in providing a common thread between the two nations. He said millions of Russian citizens have seen how well Americans and Russians can work together in space, and he indicated the two countries have understood each other's problems and achieved mutually acceptable solutions.

At the Commission, the Vice President led a series of discussions with the Russians. We had an opportunity to reiterate in the strongest of terms that they need to meet their commitments on the Service Module as a partner in the Space Station program. Prime Minister Chernomyrdin stated that Russian funding would begin to flow by the end of February to provide necessary funds to proceed with construction and that adequate funds were budgeted in 1997 to keep the Service Module on track. He further committed that the Service module would support a December launch date and challenged the Russian Space Agency to meet an accelerated October 1998 launch date.

Now we have come to a critical juncture, a fork in the road. We now have a very specific commitment from the Russian government, citing specific amounts and dates. While I am cautiously optimistic that, this time, the commitment will result in funding, we will take action based only on observed performance, not on mere statements of intent. It is the only prudent course that NASA can take. I want to thank Chairman Sensenbrenner and his colleagues for their letter of support.

Right now, the Russian Space Agency is waiting to receive funding by the end of February. It will take us some time to validate that the money has been released to the Russian Space Agency. We will then look to see if it has reached the prime contractors and sub-tier suppliers, with work being performed. If we can not validate through progress on the Service Module that money is flowing, we will take the steps necessary to pursue an alternative means to field the ISS. We want to work this out. That is our hope. I believe that with full Russian governmental funding, we will get back on track with minimal overall impact to the ISS. All of the other partners have experienced problems and we have worked through to successful resolutions. But if the money isn't flowing on time, we must move ahead with an alternate approach to protect the interest of the U.S. and other international partners.

I commit to you that the International Space Station will be built. I believe Russia's will continue to be an important part of this international partnership. Let us not forget why we brought the Russians into the program. It is in the best interest of the American people -- we could gain incredible scientific capabilities; we could develop cutting-edge technology; we could have the knowledge that Russia is focusing its technological expertise to benefit humanity and promote world peace.

Yet we have to hold the Russians accountable for holding up their end of the bargain. And we are. The partnership has to be built on responsibility and integrity. NASA is committed to these principles. I look forward to the leadership and guidance of the distinguished members of this Committee. We all want the same thing for the future -- peace and cooperation, not fear and conflict. With your support, the International Space Station can be an important part of that. It can be a symbol and the reality of a new, hard-won partnership that broke all the rules of history to find a new course, a new way, for two former Cold War enemies and the world.

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